MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

ERT2016—ENGINEERING MECHANICS
(RE)

12 MARCH 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1.This exam paper consists of only five printed pages, including this cover page.

2. Answer all questions.

3. Write all your answers in the answer booklet provided.

Question 1

a). Determine the magnitude of the moment that the force $\boldsymbol{F}$ exerts about the y-axis of the shaft shown in Fig. 1a. [9 marks]

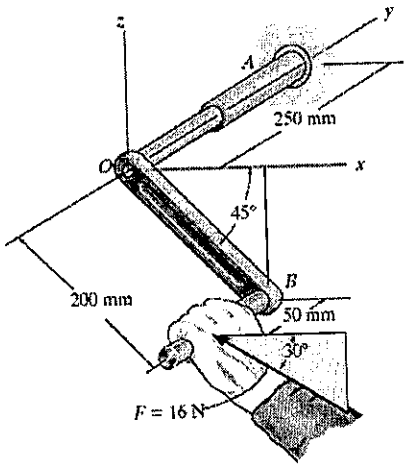

Figure 1a.

b). Determine the x-distance centroid of the solid which consists of a cylinder with a hole of length $h = 50$ mm bored into its base. See Fig. 1b. [8 marks]

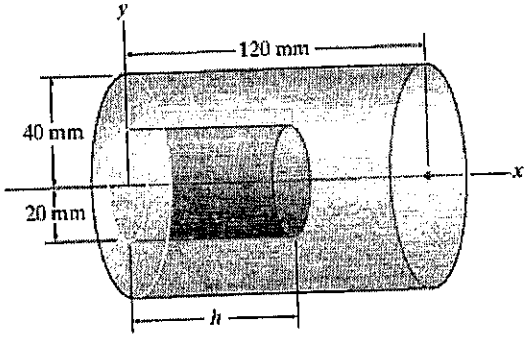

Figure 1b

c). Determine the moment of inertia of the cross-sectional area about the x-axis. See Fig. 1c. [8 marks]

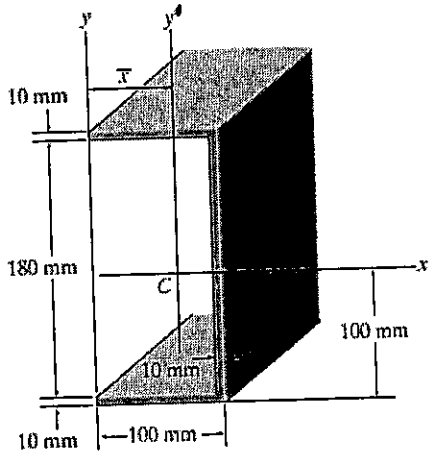

Figure 1c

Continued . . .

Question 2

a). If each box weighs 75 kg, determine the least horizontal force P that the man must exert on the top box in order to cause motion. The coefficient of static friction between the boxes is 0.5, and the coefficient of static friction between the box and the floor is 0.2. See Fig. 2a. [15 marks]

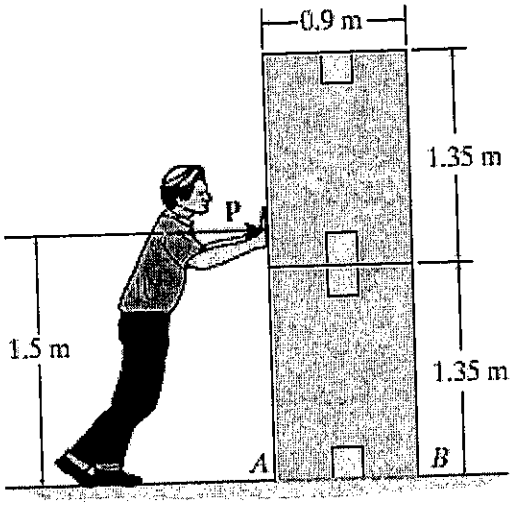

Figure 2a

b). Determine the smallest lever force P needed to prevent the wheel from rotating if it is subjected to a torque M of 250 N m. The coefficient of static friction between the belt and the wheel is 0.3. The wheel is pin connected at its center, B. See Fig. 2b. [10 marks]

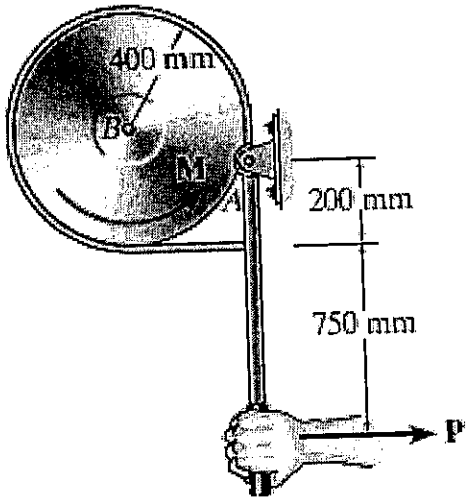

Figure 2b

Continued . . .

Question 3

a). Small packages traveling on the conveyor belt fall off into a l-m-long loading car. If the conveyor is running at a constant speed of v_c = 2 m/s, determine the smallest and largest distance R at which the end A of the car may be placed from the conveyor so that the packages enter the car. See Fig. 3a. [13 marks]

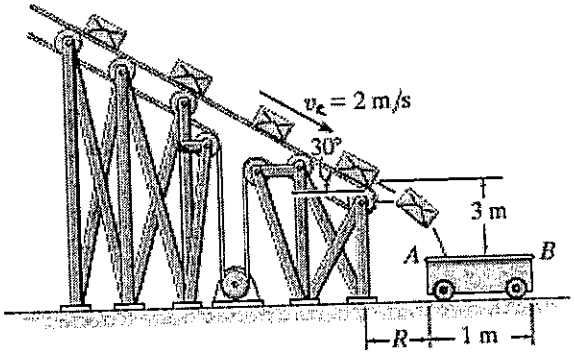

Figure 3a

b). The slotted arm AB drives pin C through the spiral groove described by the equation $r = 1.5\theta$ m, where θ is in radians. If the arm starts from rest when θ = 60° and is driven at an angular velocity of $4t$ rad/s, where t is in seconds, determine the radial and transverse components of velocity and acceleration of the pin C when the time t = 1 s. See Fig. 3b. [12 marks]

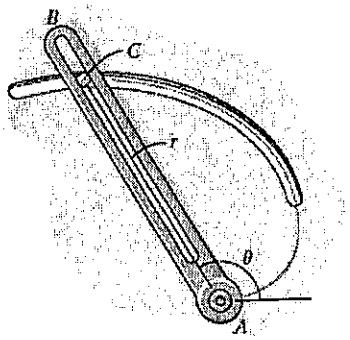

Figure 3b

Continued . . .

Question 4

a). The mechanism for a car window winder is shown Fig. 4a. Here the handle turns the small cog C, which rotates the spur gear S, thereby rotating the fixed-connected lever AB which raises track D in which the window rests. The window is free to slide on the track. If the handle is wound at 0.5 rad/s, determine the speed of points A and E and the speed v_w of the window at the instant $\theta = 30^\circ$. [13 marks]

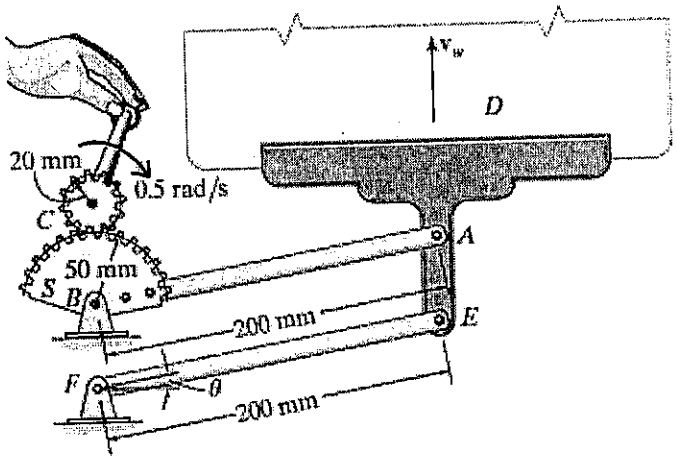

Figure 4a

b). Pinion gear A rolls on the fixed gear rack B with an angular velocity $\omega = 4$ rad/s. See Fig. 4b. Determine the velocity of the gear rack C. [12 marks]

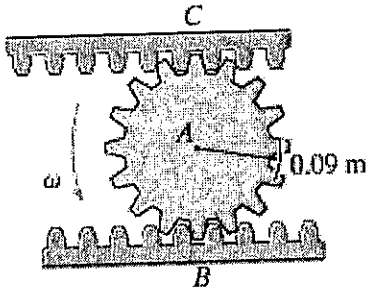

Figure 4b

End of Paper